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INCREASING THE EXTRACTION AND PROCESSING OF CRUDE OIL IN POLAND

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Poland is surrounded on the east, west, and south by countries that have significant deposits of crude oil; thus, there is every possibility that petroleum deposits could be discovered in Poland to cover the requirements of the Polish national economy.

The Polish petroleum industry is engaged in the extraction and processing of crude oil and natural gas. Despite the fact that the petroleum industry has a 100-year tradition, it has not been able significantly to increase crude-oil extraction during the last decade. The reason for this is the lack of discovered and contoured (okonturowanych) petroleum deposits in which a sufficient number of exploitable wells could be drilled to assure a continuing increase in petroleum extraction.

Up to now, geological and exploratory work has been concentrated chiefly in the Carpathian regions. Work was centered on a number of objectives, including the discovery of deposits lying at considerable depths, that is, below the shallow horizons currently exploited. It was decided that Carpathian structures are relatively small, and even in case of positive results, they would not assure adequately large increases of petroleum reserves. Several new petroleum fields discovered there have contributed only an insignificant increase to the extraction of crude oil during the last 10 years.

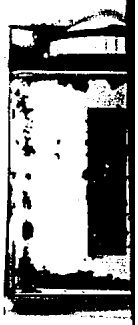
Geological and exploratory work should be far enough in advance of exploitation to assure enough new producing boreholes each year to meet the planned increase in extraction. Unfortunately, the Polish petroleum industry has not yet reached this point; in fact, it is in arrears. The elimination of the backlog requires time and significant expenditures.

Results of the explorations in the Carpathian Mountains do not indicate the discovery of large structures of rich deposits which could assure a rapid and significant increase in crude-oil extraction. Hence, deposits should be sought in those areas where there are geological analogies with deposits of neighboring countries, it can be confirmed that such areas of large structures exist in Poland. Thus, geological and exploratory work should be carried out in areas beyond the Carpathians, in the so-called Polish Lowland (Niz Polski), where a number of regions have been established capable of containing crude-oil deposits. Geophysical techniques and shallow structural drillings should first be carried out on these regions to determine points for deep exploratory drilling.

During the last 10 years, the Polish petroleum industry has made great progress on exploratory and exploitable drillings. In prewar Poland, the principal system of drilling was the percussion-drilling system. Ten years ago, the use of the modern rotary-drilling system amounted to only a small share in total drilling, whereas in 1953, it was 66 percent.

With the rotary-drilling system, boreholes can be drilled to a depth of 3,000 meters, whereas with the percussion-drilling system, drilling can be made only to a depth of 1,500 meters. The rotary-drilling system has opened new vistas for the discovery of deposits located at greater depths.

The rotary system helped to increase the drilling speed and to decrease the expenditures (rozchod) of steel pipes placed in boreholes to stregthen walls. These factors have a great influence on the reduction of drilling



costs, which is of prime interest to the petroleum industry. An analysis of the components of real costs show that there are still notable shortcomings, and that their elimination will further decrease the drilling costs. Of great concern here is the reduction of damages (awaryjnosc), which, in turn, depends on the conscientiousness and qualification of drilling crews, on the quality of drilling equipment and tools, and on the observance of technological discipline. Other factors that help to reduce real costs of drillings are improved work organization, use of so-called small mechanization to shorten the time necessary for auxiliary activities, elimination of delays in receiving supplies of materials and tools, and reduction of repair time.

During the last 10 years, great achievements have been made in supplying the petroleum industry with drilling equipment, materials, and tools. In the first few years after Poland gained its independence, the petroleum industry had to use antiquated percussion-drilling equipment. Furthermore, there was a shortage of drilling materials and tools. Then the USSR rendered aid by supplying modern rotary-drilling equipment for shallow and deep drillings. Simultaneously, petroleum workers began to plan expansion of plants to supply the petroleum industry with drilling, extractive, and processing equipment. Today, Poland has an important engineering industry that produces equipment and tools, so that imports are considerably reduced. The goal and ambition of the Polish machine and equipment building industry is to satisfy fully the requirements of the Polish petroleum industry.

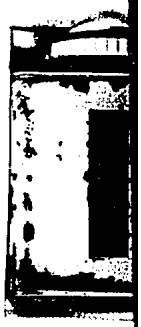
In the total expenditures for crude-oil explorations, the largest outlays have been assigned to structural and exploratory drillings. It is possible to reduce the total outlays without decreasing the effect of exploratory work by using exploratory geophysical methods such as gravimetry and seismology. These methods are inexpensive and eliminate a considerable number of drillings, since they permit closer indexes for correct location of boreholes. These methods should be widely expanded in Poland, despite the fact that geophysical equipment must be imported. This, however, presents no problem because the geophysical equipment is produced in the USSR.

In Poland, crude oil is extracted chiefly with deep-well pumps. Because a large number of low-productivity oil wells is exploited, the cost of extracting one ton of crude oil is relatively high. It is true, however, that the so-called group drives are used, that is, one motor drives several pumps, and only pumps at considerable distance from each other have individual drives. But the low productivity of certain wells unfavorably influences the average real cost of extraction.

Another factor contributing to the high cost of extraction is the wide use of secondary recovery methods and various techniques used to revive the wells. The proven and exploited deposits in Poland are not rich deposits. Moreover, crude oil has been extracted from these deposits for many years; thus the flow of the crude oil from the deposit to the well is weak and requires the use of various techniques to maintain or to revive it.

The technique of repressurizing the deposits is widely used in the Polish petroleum fields, with gas or air being forced into the crude-oil deposit by adjusting the borehole for this purpose. Gas forced into the deposit forces the crude oil from porous sandstone and drives it toward the well.

In addition, periodic techniques are used to facilitate the flow of crude oil to the well by loosening or cleaning the small channels (kanaliki) through which crude oil flows. These periodic techniques include torpedoeing, acidizing, and heating of wells.



Constant and conscientious care of wells is a very important factor in retarding the natural drop in crude-oil production. It is not sufficient to take measurements on the flow of crude oil and to establish the technology of crude-oil extraction from wells after their opening. Parameters (parametry) change with the passing of time, and optimum extraction conditions established for one day may completely change for another day. Therefore, measurements of these parameters for respective wells should be made periodically so that new operation standards for extractive equipment can be established. In the Polish petroleum industry there is still much to be done in this field, a fact that workers employed in extracting crude oil should remember.

When speaking about the petroleum industry, natural gas extraction should not be overlooked. Natural gas is not only a valuable fuel, used mainly for precision heating, but it also is a valuable chemical raw material. Its heat value is twice that of gas produced from coal.

During the last 10 years, gas extraction in Poland has increased many times and at present it is an important branch of the industry. In calorific value, extracted natural gas surpasses crude oil extraction in Poland. Through an expanded network of gas mains, natural gas can be sent from its source toward the west and north so that it reaches Slask and Warsaw; along the way, gas can be supplied to important industrial plants, as well as cities and settlements. Because gas flows from boreholes under pressure sufficient to send it considerable distances, costs of gas extraction and transportation by mains are very low.

In Poland, prospects for the expansion of natural gas extraction are good; in 1954 new rich deposits of natural gas were discovered, doubling the present known geological reserves of this raw material.

There are many countries which either have no crude oil, or have too little in relation to their requirements. Nevertheless, these countries endeavor to expand their refining industry, basing it completely or partially on imported raw materials. Among the countries in this situation are, for example, Czechoslovakia and Poland.

The opinion is frequently encountered that if a country lacks raw materials, the simplest method of supplying the country with petroleum products is to import the finished products. However, the appropriateness of expanding the refining industry in countries lacking raw materials is supported by the following economic factors:

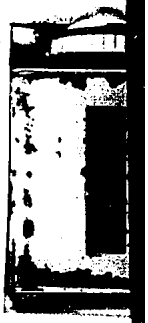
1. The economy of crude-oil processing near the petroleum-products markets.

2. Lower requirements of steel for storing raw material than finished products.

3. Ease of adjusting to changeable market conditions.

4. Ease in planning imports of raw materials in contrast to the difficulty in planning imports of full assortments of products.

In its early development, the refining industry produced a small assortme of products. Under those conditions, transportation of the products to the place of consumption was no problem; other factors, such as the availability of fuel for the refining plants in the form of natural gas from petroleum wells, were the decisive factors in locating refineries near the raw-material source. The industry now produces hundreds of different kinds of products, and the problem of transporting them is complicated by the diversity of packaging (opakowanie). Types of packaging include tanks, iron and wooden barrels, metal drums, and



glass bottles, which are generally returned to the producer when empty. Costs of transporting products under such conditions are very high; therefore, the appropriate thing to do is to shorten the distance between the producer and consumer, even at the expense of increasing the distance of transporting raw material from the source to the processing point.

Depending on the consumption of petroleum products, each country must have a certain reserve of petroleum products so as to cover the market requirements regularly. From the viewpoint of steel consumption for construction of storage tanks, it is much more economical to store raw materials than finished petroleum products. Raw material can be stored in large tanks, whereas petroleum products must be stored in large number of smaller tanks. To store 100,000 tons of raw material about 650 less tons of steel are needed than for the construction of warehouses to store the same quantity of a full assortment of finished petroleum products.

By processing a designated kind of crude oil, different outputs of individual petroleum products can be obtained, within certain limits and providing the proper processing equipment is on hand. Thus, by having a reserve of raw material, the quantitative and qualitative production can be easily regulated to the needs of the market.

As mentioned before, the refining industry produces hundreds of petroleum products used by many branches of the national economy. Precise planning for each of these products for the entire year, which is necessary for the conclusion of import agreements, is a very difficult matter. On the other hand, a properly supplied refining industry, for which only one or two kinds of raw materials have to be imported, can most economically satisfy the requirements of the country for the entire assortment of petroleum products.

Finally, the import of the raw material, rather than finished products, brings considerable savings in foreign exchange, which is of prime importance to Poland.

From the moment Poland gained its independence, the party and government created the necessary conditions for a rapid reconstruction and expansion of the crude-oil processing industry. After the reconstruction of refining plants, which was completed during the Three-Year Plan, the expansion and modernization of the refining industry was started under the Six-Year Plan. As a result, the plan for the first 5 years of the Six-Year Plan was fulfilled in August 1954.

Compared with 1950, the indexes for 1954 are as follows (1950 equals 100):

Item	Percent
Quantity of crude oil processed annually	233
Value of total production at base-year prices	277
No of workers in the industrial [refining?] group	127
Work productivity calculated at base-year prices per worker	218

It is interesting to note that with the 133-percent increase in crude-oil processing, employment increased only by 27 percent, which proves that a significant improvement has been made in work productivity and qualifications of the workers. The construction of new processing equipment and the improvement in operations of old equipment contributed greatly to the increase in work productivity. The faster increase in the index for the value of production over the index for the quantity of crude oil processed proves that the quality of the products has improved.

Despite these great achievements, there are still important tasks facing the refining industry. A further expansion and modernization of the refining plants should lead to a full supply of petroleum products for the national economy and to a maximum reduction in the quantity and assortment of imported finished products. Under such conditions, the possibility for exporting surpluses of certain products should be created. On the basis of Soviet aid and the steadily increasing level of technical and political consciousness of all workers of the industry, there is every reason to believe that the refining industry will fulfill its tasks.

The Polish extractive industry and the crude-oil processing industry have all the requisites for a further expansion, even though significant difficulties appear in certain sectors. This particularly pertains to the search for new crude-oil deposits. Nevertheless, these difficulties will be overcome through the help of the party and the government.

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